WO 01/12803 PCT/US00/22086

-32-

Claims

1. A method for reducing vancomycin resistance in a vancomycin-resistant organism comprising:

introducing into the organism at least one anti-sense vancomycin resistance molecule under conditions to inhibit expression of a vancomycin resistance gene.

- 2. The method of claim 1, wherein the vancomycin resistant organism is selected from the group consisting of the Gram-positive bacteria, Enterococcus faecalis and Enterococcus faecium, and other Gram-positive bacteria such as Staphylococcus species, and Streptococcus species, to which these organisms have the potential of transferring resistance determinants.
- 3. The method of claim 1, wherein the vancomycin resistant organism is a Gram-positive bacteria.
- 4. The method of claim 3, wherein the Gram-positive bacteria is an enterococcus.
- 5. The method of claim 1, wherein the vancomycin resistant organism is selected from the group consisting of a VanA resistant organism, a VanB resistant organism, a VanC resistant organism, and a VanD resistant organism.
- 6. The method of claim 1, wherein the vancomycin resistant organism is a vanA resistant organism and the anti-sense vancomycin resistance molecule is selected from the group consisting of a vanA anti-sense molecule, a vanR antisense molecule, a vanS anti-sense molecule, a vanH anti-sense molecule, a vanY anti-sense molecule, a vanY anti-sense molecule and a vanZ anti-sense molecule.
- 7. The method of claim 1, wherein the vancomycin resistant organism is a VanB resistant organism and the anti-sense vancomycin resistance molecule is selected from the group consisting of a vanRB anti-sense molecule, a vanSB anti-sense molecule, a vanYB anti-sense molecule, a vanW anti-sense molecule, a vanHB anti-sense molecule, and a vanXB anti-sense molecule.

WO 01/12803 PCT/US00/22086

-33-

- 8. The method of claim 1, wherein the anti-sense vancomycin resistant organism is a VanC resistant organism.
- 9. The method of claim 1, wherein the vancomycin resistant organism is a VanD resistant organism and the anti-sense vancomycin resistance molecule is selected from the group consisting of a vanD anti-sense molecule, a vanRD anti-sense molecule, a vanSD anti-sense molecule, a vanYD anti-sense molecule, a vanYD anti-sense molecule, a vanYD anti-sense molecule.
- 10. The method of claim 1, wherein the anti-sense vancomycin resistance molecule is a vanA antisense molecule selected from the group consisting of:

an antisense molecule that hybridizes to the complete vanA gene sequence; and an antisense molecule that hybridizes to a conserved region of the vanA gene sequence.

- 11. The method of claim 10, wherein the *vanA* antisense molecule hybridizes to a conserved region of the *vanA* gene including from 10 to 30 nucleotides.
- 12. The method of claim 11, wherein the *vanA* gene encodes an enzyme and the *vanA* antisense molecule hybridizes to a region of the *vanA* gene which encodes an active site of the ligase.
- 13. The method of claim 1, wherein introducing the anti-sense vancomycin resistance molecule comprises contacting the vancomycin resistant organism with at least one vector comprising one or more "anti-sense vancomycin resistance molecules" under conditions to allow the vector to enter the organism and inhibit expression of one or more vancomycin resistance genes.
- 14. The method of claim 13, wherein the vector is selected from the group consisting of: an enterococcal shuttle vector, an enterococcal or any other species or strain of bacteriophage; the nucleic acid portion of a peptide nucleic acid molecule; an enterococcal conjugative transposon or a pheromone-responsive plasmid.

- 15. The method of claim 14, wherein the vector is an enterococcal shuttle vector.
- 16. The method of claim 13, wherein the vector contains a single copy of a vanA antisense molecule.
- 17. The method of claim 13, wherein the vector contains multiple copies of a vanA antisense molecule.
- 18. The method of claims 16 or 17, wherein the vector comprises a VanR-responsive promoter operatively coupled to the vanA antisense molecule.
- 19. The method of claim 1, wherein the anti-sense vancomycin resistance molecule is a vanX antisense molecule selected from the group consisting of:

an antisense molecule that hybridizes to the complete vanX gene sequence; and an antisense molecule that hybridizes to a conserved region of the vanX gene sequence.

20. A method for reducing vancomycin resistance in a vancomycin-resistant organism comprising:

enhancing expression of a *vanH* promoter in the organism to an amount sufficient to reduce vancomycin resistance in the organism, wherein the *vanH* promoter is not operatively coupled to a vancomycin resistance gene of the organism.

- 21. The method of claim 20, wherein the *vanH* promoter is operatively coupled to an antisense vancomycin resistance molecule.
- 22. The method of claims 20 or 21, wherein the *vanH* promoter is contained on an enterococcus vector and enhancing expression comprises introducing into the organism an amount of the vector to express an amount of the *vanH* promoter sufficient to bind to phosphorylated *VanR* and thereby reduce vancomycin resistance in the organism.
- 23. The method of claim 20, further comprising co-administering into the organism an antisense vancomycin resistance molecule operatively coupled to a *vanH* promoter.

WO 01/12803 PCT/US00/22086

-35-

- 24. An isolated nucleic acid that hybridizes under stringent conditions to a nucleic acid molecule selected from the group consisting of SEQ ID NOs:1-13.
- 25. An isolated nucleic acid that hybridizes under stringent conditions to a nucleic acid molecule selected from the group consisting of SEQ ID NOs:5-13.
- 26. An isolated nucleic acid that hybridizes under stringent conditions to a nucleic acid molecule having a sequence selected from the group consisting of SEQ ID NOs:5-10.
- 27. A vector comprising an isolated nucleic acid molecule of any of claims 24, 25 or 26.
- 28. The vector of claim 27, further comprising a vanH promoter operatively coupled to the isolated nucleic acid molecule.
- 29. An isolated vancomycin resistant organism comprising a vector of claim 27 or 28.